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UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE BOARD OF PATENT APPEALS
AND INTERFERENCES

Ex parte ALFRED I-TSUNG PAN and
LAURIE S. MITTELSTADT

Appeal 2009-003054
Application 10/629,742
Technology Center 1700

Decided: January 26, 2010

Before EDWARD C. KIMLIN, PETER F. KRATZ, and MARK NAGUMO,
Administrative Patent Judges.

NAGUMO, *Administrative Patent Judge.*

DECISION ON APPEAL

A. Introduction¹

Alfred I-Tsung Pan and Laurie S. Mittelstadt (“Pan”) timely appeal under 35 U.S.C. § 134(a) from the final rejection² of claims 1-17, 21-25,

¹ Application 10/629,742, *Stereolithographic Method and Apparatus for Forming Three-Dimensional Structure*, filed 30 July 2003. The real party in interest is listed as Hewlett-Packard Development Company, L.P. (Appeal Brief, filed 5 March 2008 (“Br.”), 2.)

and 31-38, which are all of the pending claims. We have jurisdiction under 35 U.S.C. § 6. We AFFIRM-IN-PART.

The subject matter on appeal relates to methods of forming three-dimensional structures by building up the structures from drops of materials that are subsequently solidified. The growing structure is supported by a viscous liquid, which is said to enable the production of complex shapes having overhangs and undercuts without the use of secondary supporting structures such as scaffolds. In a first embodiment, two different kinds of solidifiable liquid drops are required. In a second embodiment, the completed structure is removed from the viscous liquid and the viscous liquid remaining in the voids of the structure is solidified.

Representative Claims 1 and 21 are reproduced from the Claims Appendix to the Principal Brief on Appeal:

1. A stereolithographic method of forming three-dimensional structure comprising:
 - a) ejecting drops of *first and second different liquefied materials* in a pattern and allowing the drops to solidify to form a layer of a three-dimensional object,
wherein the second liquefied material is deposited to form portions of the layers which define an external surface of the three-dimensional object;
 - b) surrounding the layer with a viscous liquid and controlling the level of the viscous liquid to be essentially level with the uppermost level of the portion of the layer formed from the drops of liquefied material;

² Office action mailed 8 January 2008 (“Final Rejection”; cited as “FR”).

- c) ejecting drops of the first and second liquefied materials in a pattern and allowing the drops to solidify and form another layer of the three-dimensional object;
- d) raising the level of the viscous liquid to a level proximate the uppermost level of the newly formed layer; and
- e) repeating steps c) and d).

(Claims App., Br. 10; indentation, paragraphing, and emphasis added.)

21. A method of forming a three-dimensional object comprising:

- ejecting drops of liquefied material into a vat using an ejector;
- scanning the ejector in first and second mutually opposed directions to deposit and solidify said drops in a predetermined pattern to sequentially form layers of the three-dimensional object;
- supplying a viscous liquid into the vat to a level which is essentially level with the top of a most recently formed layer of the three-dimensional object, wherein
 - said viscous liquid both supports the material being formed into a three-dimensional object and fills in voids between drops of the material forming the three-dimensional object; and
- removing the object from the viscous liquid in the vat and then*
 - solidifying the viscous liquid remaining in the voids between solidified drops of the material forming the object.*

(Claims App., Br. 12; indentation, paragraphing, and emphasis added.)

The Examiner has maintained the following grounds of rejection:³

- A. Claims 1-3, 9-11, 14, 15, and 36 stand rejected under 35 U.S.C. § 103(a) in view of the combined teachings of Ederer⁴ and Moszner.⁵
- B. Claims 4-8 stand rejected under 35 U.S.C. § 103(a) in view of the combined teachings of Ederer, Moszner, and Jang.⁶
- C. Claims 12, 13, 16, 17, and 37 stand rejected under 35 U.S.C. § 103(a) in view of the combined teachings of Ederer, Moszner, and Fink.⁷
- D. Claim 38 stands rejected under 35 U.S.C. § 103(a) in view of the combined teachings of Ederer, Moszner, and Edie.⁸
- E. Claims 21, 25, and 31-35 stand rejected under 35 U.S.C. § 103(a) in view of the teachings of Ederer.
- F. Claims 22-24 stand rejected under 35 U.S.C. § 103(a) in view of the combined teachings of Ederer and Jang.

³ Examiner's Answer mailed 5 May 2008. ("Ans.").

⁴ Ingo Ederer and Rainer Hochsmann, *Rapid-Prototyping Method and Apparatus*, U.S. Patent 6,838,035 B1 (4 January 2005), accorded an effective filing date under 35 U.S.C. § 371 of 8 April 2002.

⁵ Norbert Moszner et al., *Desktop Process for Producing Dental Products by Means of 3-Dimensional Plotting*, U.S. Patent 6,93,489 B2 (6 September 2005), based on an application filed 25 March 2002.

⁶ Borzeng Jang et al., *Rapid Prototyping and Tooling System*, U.S. Patent 5,406,095 B1 (11 June 2002).

⁷ David J. Fink et al., *Method for Free-Formation of a Free-Standing, Three-Dimensional Body*, U.S. Patent 5,510,066 (1996).

⁸ Colin Edie et al., *Methods of Forming a Plurality of Spheres; and Pluralities of Spheres*, U.S. Patent 6,579,479 B1 (17 June 2003), based on an application filed 9 November 2000.

Pan contends the Examiner erred in rejecting independent claim 1 because, in Pan's view, "Moszner never refers to the application of more than one [liquid] material to form the object." (Br. 5, ll. 7-8.) Moreover, according to Pan, the Examiner failed to show any evidence supporting the Examiner's reasons to combine the teachings of Moszner with those of Ederer. (*Id.* at 6-7.)

Pan contends further that the Examiner erred in rejecting independent claim 21 in view of Ederer because there is no reason to solidify the viscous supporting liquid taught by Ederer. (Br. 7-8.)

B. Discussion

Findings of fact set out *infra* are supported by a preponderance of the evidence of record.

As the Appellant, Pan bears the procedural burden of showing harmful error in the Examiner's rejections. *See, e.g., In re Kahn*, 441 F.3d 977, 985-86 (Fed. Cir. 2006) ("On appeal to the Board, an applicant can overcome a rejection [under § 103] by showing insufficient evidence of *prima facie* obviousness") (citation and internal quote omitted). Arguments not timely raised have been waived. 37 C.F.R. § 41.37(c)(1)(vii), second sentence.

According to Pan, all dependent claims stand or fall with the respective independent claims. (Br. 4, ll. 24-26; 7, ll. 19-20.)

Regarding claim 1, Pan does not dispute the Examiner's finding (Office Action mailed 16 July 2007, incorporated by reference in the Final

Rejection, FR 3, ll. 1-2) that Ederer teaches all limitations of claim 1 but for the use of a second different liquefied material drop. We therefore accept the Examiner's findings as true for the purposes of this appeal. *Cf. In re Kunzmann*, 326 F.2d 424, 425 n.3 (CCPA 1964) (a finding not shown by the Appellant to be erroneous may be accepted as fact.) Pan's assertion that “[a] thorough search of Moszner reveals that Moszner never refers to the application of more than one [liquid] material to form the object” (Br. 5, ll. 7-8) is rebutted by considering the passages cited by the Examiner (Office Action mailed 16 July 2007 at 5, l. 1; FR 3, ll. 1-2; Ans. 4, 2nd full para.).

Moszner describes methods of building up dental form pieces for dental restoration and replacement parts such as inlays, onlays, bridges, and crowns. (Moszner, col. 1, ll. 18.) The pieces are built up by depositing drops of a hardenable material through a nozzle. (*Id.* at col. 3, ll. 46-50 and 56-65, and at col. 3, l. 66 to col. 4, l. 4.)

In the first passage cited by the Examiner, Moszner teaches that “[d]ose adjustable cartridges or several cartridges can be exchanged in the course of material supply.” (Moszner, col. 4, ll. 5-7.) It does not take too much imagination to realize that the exchanged cartridges can contain the same or different materials. The last passage cited by the Examiner is Moszner, claim 1, the last two lines of which read, “wherein the form piece is built up in layers with different types of material.” (*Id.* at col. 12, ll. 50-51.) This teaching of different materials for the liquid drops is explicit.

The second passage of Moszner cited by the Examiner, particularly when considered in context, is also explicit. Moszner, at col. 5, ll. 44-52,

states in the last sentence, “[i]f, for example, the labial side of a front tooth were to be modeled, the arrangement of the build up of the layers is preferably performed such that the labial finishing layer of the front dental replacement product is applied as the last layer.” This passage clearly describes at least two different materials for the liquid drops, one of which is particularly useful for the surface layer of the tooth. Consideration of the immediately preceding paragraph removes any possible doubt, as it teaches that a dental replacement product “frequently has a plastic or ceramic material similar to that of a natural tooth which material corresponds to the tooth bloom but, also, the dental replacement product comprises plastic or ceramic material which corresponds to the dentin.” (*Id.* at ll. 37-41.) Thus, a person having ordinary skill in the art could be in no doubt that Moszner teaches that multiple kinds of liquid drop materials are useful for fabricating dental replacement products.

Pan’s objections that the Examiner failed to provide evidence supporting the reason to combine the teachings of Ederer and Moszner are without merit. Both references describe similar ways of building up three dimensional structures using liquid drops of materials that are then solidified. The Examiner’s reliance on Moszner’s teachings of using two different material drops in such a process as evidence that a person having ordinary skill in the art would have found it obvious to use two different material liquid drops in the process described by Ederer is unexceptional. Indeed, absent an express prohibition to use a second liquid drop forming material, it is difficult to imagine when the use of a second material having some different properties but having the same drop-forming and hardenable

properties as a first material, in addition to a first such material, would not be obvious. In the present case, Moszner provides a compelling reason to use the second material, i.e., to mimic the different materials found in the natural teeth that are to be repaired or replaced.

Because we conclude that Pan has not shown harmful error in the Examiner's rejection of claim 1, we AFFIRM rejections A through D.

Claim 21 stands differently. As Pan points out (Br. 7-8), the Examiner has not pointed to any teaching in Ederer—or in any other prior art of record—that indicates the desirability of removing the built-up structure from the viscous supporting liquid and solidifying the viscous liquid that remains in the interstices of the structure. Nor has the Examiner identified any viscous liquid disclosed by Ederer that would have been recognized by persons having ordinary skill in the art as being potentially hardenable, and thus suggestive of such a use. Lacking such evidence in the prior art of record, the Examiner's rejection is based, at best, on challenged and unsubstantiated Official Notice. Such rejections, when maintained, are properly denominated “hindsight.” Accordingly, we are constrained to REVERSE rejections E and F.

D. Order

We AFFIRM the rejection of claims 1-3, 9-11, 14, 15, and 36 under 35 U.S.C. § 103(a) in view of the combined teachings of Ederer and Moszner.

We AFFIRM the rejection of claims 4-8 under 35 U.S.C. § 103(a) in view of the combined teachings of Ederer, Moszner, and Jang.

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We AFFIRM the rejection of claims 12, 13, 16, 17, and 37 under 35 U.S.C. § 103(a) in view of the combined teachings of Ederer, Moszner, and Fink.

We AFFIRM the rejection of claim 38 under 35 U.S.C. § 103(a) in view of the combined teachings of Ederer, Moszner, and Edie.

We REVERSE the rejection of claims 21, 25, and 31-35 under 35 U.S.C. § 103(a) in view of the teachings of Ederer.

We REVERSE the rejection of claims 22-24 under 35 U.S.C. § 103(a) in view of the combined teachings of Ederer and Jang.

No time period for taking any subsequent action in connection with this appeal may be extended under 37 C.F.R. § 1.136(a).

AFFIRMED-IN-PART

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